

PTO-1390
(REV. 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER
P/63020-PCTTRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

10/019923

INTERNATIONAL APPLICATION NO.
PCT/IB00/00839INTERNATIONAL FILING DATE
May 12, 2000PRIORITY DATE CLAIMED
May 12, 1999

TITLE OF INVENTION SINGLE SIDEBAND MIXER

APPLICANT(S) FOR DO/EO/US Hardial GILL; Gregor GERHARD; Stefan KOCH

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371 (f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information: **Receipt Acknowledgement Postcard**

U.S. APPLICATION NO. (if known, see 37 CFR 1.53)

10/019923

INTERNATIONAL APPLICATION NO
PCT/IB00/00839ATTORNEY'S DOCKET NUMBER
P/63020-PCT21. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :**Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO \$1,040.00International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO \$890.00International preliminary examination fee (37 CFR 1.482) not paid to USPTO
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00International preliminary examination fee (37 CFR 1.482) paid to USPTO
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00**ENTER APPROPRIATE BASIC FEE AMOUNT =**

\$890.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	8 - 20 =	0	x \$18.00	\$0.00	
Independent claims	1 - 3 =	0	x \$84.00	\$0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$280.00	\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$890.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$0.00	
SUBTOTAL =				\$890.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$0.00	
TOTAL NATIONAL FEE =				\$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$0.00	
TOTAL FEES ENCLOSED =				\$890.00	
				Amount to be refunded:	\$
				charged:	\$

- a. ☒ A check in the amount of **\$890.00** to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of \$_____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. 11-1145. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card
information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

KIRSCHSTEIN, OTTINGER, ISRAEL & SCHIFFMILLER, P.C.
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SIGNATURE.

Alan Israel
NAME

27,564
REGISTRATION NUMBER

531 Rec'd PGT/PTC 09 NOV 2001

PATENTS
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

International Application No.:	PCT/IB00/00839
International Filing Date	: May 12, 2000
In re: Application of	: Hardial GILL
Deposited	: November 9, 2001
For	: SINGLE SIDEBAND MIXER

New York, New York
November 9, 2001

PRELIMINARY AMENDMENT

BOX: PCT
Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee and before examination, kindly amend the above captioned application as follows:

IN THE CLAIMS:

Please cancel claims 1-8, without prejudice.

Please add the new set of claims set forth on the enclosed pages.

IN THE ABSTRACT:

Delete the "Abstract" on the PCT cover sheet and replace it with the "Abstract of the Disclosure" set forth on a separate sheet attached hereto.

REMARKS

An abstract has been provided on a separate sheet; and the claims have been amended to conform to U.S. practice.

Wherefore, an early action on the merits is earnestly solicited.

Respectfully submitted,

KIRSCHSTEIN, OTTINGER, ISRAEL & SCHIFFMILLER, P.C.

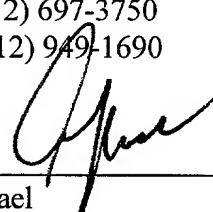
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Registration No. 27,564

ABSTRACT OF THE DISCLOSURE

A single sideband mixer for radio frequency signals is integrated on a uniform semiconductor substrate in a space-saving manner. The inventive single sideband mixer comprises two double-sideband mixers which are switched with identical first signals and with phase quadrature second signals in order to form a product signal from the two signals. The single sideband mixer also comprises an adder for superimposing the two product signals to form an output signal with a sideband. An amplifier is connected in an input circuit to each mixer in order to generate the first signal, and the amplifiers have inputs which are connected to the same signal source via a forked line. The signal source of the amplifiers can be a pre-amplifier or can be an input of the single sideband mixer directly.

PROPOSED NEW CLAIMS

9. A single sideband mixer circuit for high frequency signals, comprising: two double sideband mixers each being wired with identical first signals and with second signals phase-shifted by 90° relative to each other, in order to form a product signal from the first and second signals of each mixer; an adder for superimposing the product signal from each mixer to form an output signal with one sideband; and two amplifiers for generating the first signals, each amplifier being connected upstream of each mixer, the amplifiers having inputs connected to a same signal source via a forked line.

10. The single sideband mixer circuit according to claim 9, wherein the signal source is a preamplifier.

11. The single sideband mixer circuit according to claim 9, wherein each first signal is a radio frequency signal, and wherein each second signal is a local oscillator signal, and further comprising a first 90° coupler connected to a local oscillator input of the single sideband mixer circuit to generate the second signals.

12. The single sideband mixer circuit according to claim 9, wherein the signal source is a signal input of the single sideband mixer circuit.

13. The single sideband mixer circuit according to claim 12, wherein each first signal is a local oscillator signal, and wherein each second signal is an intermediate frequency signal, and further comprising a first 90° coupler connected to an intermediate frequency input of the single sideband mixer circuit to generate the second signals.

14. The single sideband mixer circuit according to claim 9, and further comprising a final amplifier for the product signal arranged between an output of each double sideband mixer and the adder.

15. The single sideband mixer circuit according to claim 9, wherein each double sideband mixer, each amplifier, and the adder are integrated on a single semiconductor substrate.

16. The single sideband mixer circuit according to claim 11, wherein the adder is a second 90° coupler.

10/019923 TCA Translation
531 Rec'd PCT 09 NOV 2001

WO 00/70745

PCT/1B00/00839

Single Sideband Mixer

The invention concerns a single sideband mixer for high frequency signals. Such mixers are used in high frequency technology to generate a lower frequency signal (intermediate frequency, IF) from a higher frequency signal (radial frequency, RF) (down-converter or demodulator) or to generate a higher frequency signal from a lower frequency signal (up-converter or modulator). The IF signal is produced in the down-converter by mixing of the RF signal with the LO signal (local oscillator, LO). The RF signal is produced in the up-converter by mixing of the IF signal with the LO signal. Simple multiplication of an input signal (RF or IF) with the LO signal produces output signals with two sidebands shifted into the IF or RF range. A single sideband mixer produces only one of these two sidebands in the output signal. It is produced by appropriate connection of two individual double sideband mixers, hereinafter referred to simply as mixers. Their function can be understood as a multiplication of their two input signals.

Single sideband mixers for high frequency signals are known, comprising two mixers, each of which is wired with identical first signals and with second signals phase-shifted by 90° relative to each other, in order to form a product signal from the two signals, and an adder element to superimpose the two product signals to an output signal with only one sideband. A typical such demodulator is shown in Fig. 3. The RF signal here is fed from an input 4 via one or more amplifiers 1 and a 0° power divider, for example, a so-called Wilkinson divider, to two mixers 3. A 90° coupler 6 connected to a local oscillator input 5 delivers local oscillator signals, each phase-shifted by 90° , to the corresponding inputs of mixer 3. Intermediate frequency signals, phase-shifted by 90° , with both sidebands are obtained at the outputs of the mixer because of this. These are referred to as in-phase (IF/I) or quadrature-phase signals (IF/Q). These two intermediate frequency signals are combined or superimposed via a second 90° coupler 7 and produce the output intermediate frequency signal. Owing to phase-shifted feed of the local

oscillator signal to the two mixers, an in-phase and anti-phase signal are superimposed by the two sidebands of the in-phase branch and the quadrature branch behind the second 90° coupler 7. Two output signals, each of which contains only one of the two sidebands, are obtained at the two output terminals of the second 90° coupler 7. One of these terminals forms an output terminal 8 of the single sideband mixer; the other output is terminated with the wave impedance, in order to suppress interference signals and noise at the location of the undesired sideband (image frequency).

The power divider 2 of this ordinary single sideband mixer is required in order to decouple the in-phase branch and the quadrature branch of the single sideband mixer, i.e., to prevent the two mixers 3 from mutually influencing each other via their RF inputs. This type of power divider 2 includes coupled lines with a length of $\lambda/4$, in which λ is the wavelength of the radio frequency in the line. At technically relevant frequencies, this length corresponds to at least 1 mm. The power divider is therefore a very extensive part in comparison with the other components of the circuit, which is only poorly suited, for cost reasons, for integration on a common semiconductor substrate, together with the amplifiers, mixers or other components of the single sideband mixer. It is therefore used in the form of a discrete component, whose output terminals are connected to the conductor tracks leading to the mixers 3 via bond wires. To obtain good suppression of the undesired sideband at the output of the single sideband mixer, the signal travel times in the two branches must be adjusted to each other with micrometer accuracy, in order to guarantee that the product signals of the two mixers arrive at the second 90° couple 7 in the proper phase position. This can only be guaranteed with difficulty with the wire bonding technique.

Advantages of the Invention

A single sideband mixer for high frequency signals of the type defined at the outset is devised by the invention, which is readily suited for complete integration on a semiconductor substrate. This advantage is achieved in that an amplifier is connected upline of each mixer, and that these amplifiers have inputs connected to the same signal source via a forked line. The blocking power divider can drop out in this circuit topology, since the amplifiers already guarantee

sufficient decoupling of two branches of the single sideband mixer, in which they block out interference signals issued by the mixers at their input line.

The signal source from which the amplifiers receive their input signal can be a common preamplifier connected at one input. In this case, the first signal is preferably an RF signal and the second signal a LO signal, and a first 90° coupler to generate the second signal is connected to an LO input of the signal sideband mixer.

The signal source can also be a signal input of the single sideband mixer. In this case, for example, the first signal can be a LO signal and the second signal an IF signal, and a first 90° coupler to generate the second signals is connected to an IF input of the sideband mixer.

Additional features and advantages of the invention are apparent from the following description, with reference to the figures.

In the figures

Figure 1 shows a down-converter as first practical example of the invention;

Figure 2 shows an up-converter as second practical example; and

Figure 3, which was already described above, shows an ordinary single sideband mixer.

The down-converter depicted in Figure 1 is fully integrated on a semiconductor substrate made of gallium arsenide. It includes a preamplifier 9 connected to a radio frequency (RF) input 4, whose output is connected via a single forked line 11 to two amplifiers 1, each of which pertain to an in-phase branch and quadrature branch of the single sideband mixer. These amplifiers 1 are based on fast field effect transistors, whose space requirements, on a semiconductor substrate at about $100 \times 200 \mu\text{m}$, are much smaller than those of a power divider. Since the amplifiers and preamplifiers are integrated on a common substrate, bond connections drop out, so that the line lengths between the preamplifier 9 and amplifiers 1, on the one hand, and between the amplifiers

1 and the mixers 3 connected to their outputs can be stipulated with an accuracy of a few micrometers without difficulty during production. Although the in-phase and quadrature branch of the single sideband mixer each contain one more component than in the ordinary single sideband mixer, it is simpler in the single sideband mixer according to Figure 1 to maintain a desired phase ratio between the signals on the two branches during production.

The mixers 3 connected to the outputs of amplifier 1 also have an input for a local oscillator signal, which they obtain, each phase-shifted by 90° , from a 90° phase coupler 6, to which the local oscillator signal is again fed via an input 5 from the outside. A second input of coupler 6 is terminated with the wave impedance.

The two mixers 3 each deliver an in-phase or quadrature intermediate frequency signal to the inputs of the second 90° coupler 7, one output of which forms the intermediate frequency output of the single sideband mixer, and a second output is terminated with the wave impedance.

The 90° couplers 6 and 7 can each be integrated on the gallium arsenide substrate as hybrid elements.

Figure 2 shows application of the principle of the present invention to an up-converter. This single sideband mixer is also integrated on a single semiconductor substrate. The inputs of the two amplifiers 1 are connected via a simple forked line 11 to an input 5 for a local oscillator signal.

The intermediate frequency signal to be mixed with the local oscillator is fed from an input 4 via a 90° coupler 6 to the two mixers 4, each phase-shifted by 90° . The two mixers 3 generate radio frequency signals with two sidebands from it. These radio frequency signals with two sidebands are again fed to a 90° mixer 7, which superimposes them to two radio frequency signals, each with one sideband, that are delivered at the outputs 8A, 8B.

The linearity of the RF path to the mixer outputs is improved by additional amplifiers 10 in front of the 90° coupler 7.

[illegible]

Claims

1. Single sideband mixer for high frequency signals with two double sideband mixers (3), each of which are wired with identical first signals and with second signals phase-shifted by 90° relative to each other, in order to form a product signal from the two signals, and an adder element (7) to superimpose the two product signals to an output signal with one sideband, characterized by the fact that an amplifier (1) to generate the first signal is connected upline of each mixer (3), and that the amplifiers (1) have inputs connected to the same signal source (5, 9) via a forked line (11).
2. Single sideband mixer according to Claim 1, characterized by the fact that the signal source is a preamplifier (9).
3. Single sideband mixer according to Claim 2, characterized by the fact that the first signal is a radio frequency signal and the second signal a local oscillator signal, and that a first 90° coupler (6) is connected to a local oscillator input (5) of the single sideband mixer to generate the second signals.
4. Single side band mixer according to Claim 1, characterized by the fact that the signal source is a signal input (5) of the single sideband mixer.
5. Single sideband mixer according to Claim 4, characterized by the fact that the first signal is a local oscillator signal and the second signal an intermediate frequency signal, and that a first 90° coupler (6) is connected to an intermediate frequency input (4) of the single sideband mixer to generate the second signals.
6. Single sideband mixer according to one of the preceding claims, characterized by the fact that a final amplifier (10) for the product signal is arranged between the output of the double sideband mixer (3) and the adder element (7).

7. Single sideband mixer according to one of the preceding claims, characterized by the fact that the double sideband mixer (3), the amplifier (1), the adder element (7) and optionally the preamplifier (9), the first 90° coupler (6) or the final amplifier (10) are integrated on a single semiconductor substrate.

8. Single sideband mixer according to one of the preceding claims, characterized by the fact that the adder element is a second 90° coupler (7).

202210-012200

PCTWELTORGANISATION FÜR GEISTIGES EIGENTUM
Internationales BüroINTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation ⁷ : H03D 7/16, H03C 1/60		A1	(11) Internationale Veröffentlichungsnummer: WO 00/70745
			(43) Internationales Veröffentlichungsdatum: 23. November 2000 (23.11.00)
(21) Internationales Aktenzeichen: PCT/IB00/00839 (22) Internationales Anmeldedatum: 12. Mai 2000 (12.05.00) (30) Prioritätsdaten: 199 21 921.4 12. Mai 1999 (12.05.99) DE (71) Anmelder (für alle Bestimmungsstaaten ausser US): MARCONI COMMUNICATIONS GMBH [DE/DE]; Serberstrasse 33, D-71520 Backnang (DE). (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): GILL, Hardial [GB/DE]; Elly-Heuss-Knapp-Weg, 38/3, D-71522 Backnang (DE). GERHARD, Gregor [DE/DE]; Heinrich Von Zuegel-Strasse 15, D-71540 Murrhardt (DE). KOCH, Stefan [DE/DE]; Am Neufeld 21, D-71570 Oppenweiler (DE). (74) Anwalt: CAMP, Ronald; Marconi Intellectual Property, Waterhouse Lane, Chelmsford, Essex CM1 2QX (GB).		(81) Bestimmungsstaaten: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO Patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), eurasisches Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI Patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Veröffentlicht <i>Mit internationalem Recherchenbericht.</i>	
(54) Title: SINGLE SIDEBAND MIXER			
(54) Bezeichnung: EINSEITENBANDMISCHER			
(57) Abstract <p>The invention relates to a single sideband mixer for radio frequency signals which can be integrated on a uniform semiconductor substrate in a space-saving manner. The inventive single sideband mixer comprises two double-sideband mixers (3) which are switched with identical first signals and with phase quadrature second signals in order to form a product signal from the two signals. The single sideband mixer also comprises an adder (7) for superimposing the two product signals to form an output signal with a sideband. An amplifier (1) is connected in incoming circuit to each mixer (3) in order to generate the first signal, and the amplifiers (1) have inputs which are connected to the same signal source via a forked line (11). The signal source of the amplifiers (1) can be a pre-amplifier (9) or can be an input of the single sideband mixer directly.</p>			
(57) Zusammenfassung <p>Ein zur platzsparenden Integration auf einem einheitlichen Halbleitersubstrat geeigneter Einseitenbandmischer für Radiofrequenzsignale umfaßt zwei Zweiseitenbandmischer (3), die mit identischen ersten Signalen und mit um 90° gegeneinander phasenverschobenen zweiten Signalen geschaltet sind, um jeweils ein Produktsignal aus den zwei Signalen zu bilden, und ein Addierglied (7) zum Überlagern der zwei Produktsignale zu einem Ausgangssignal mit einem Seitenband. Zum Erzeugen des ersten Signals ist jedem Mischer (3) ein Verstärker (1) vorgeschaltet, und die Verstärker (1) haben über eine gegabelte Leitung (11) mit der gleichen Signaquelle verbundene Eingänge. Die Signaquelle der Verstärker (1) kann ein Vorverstärker (9) oder auch direkt ein Eingang des Einseitenbandmischers sein.</p>			

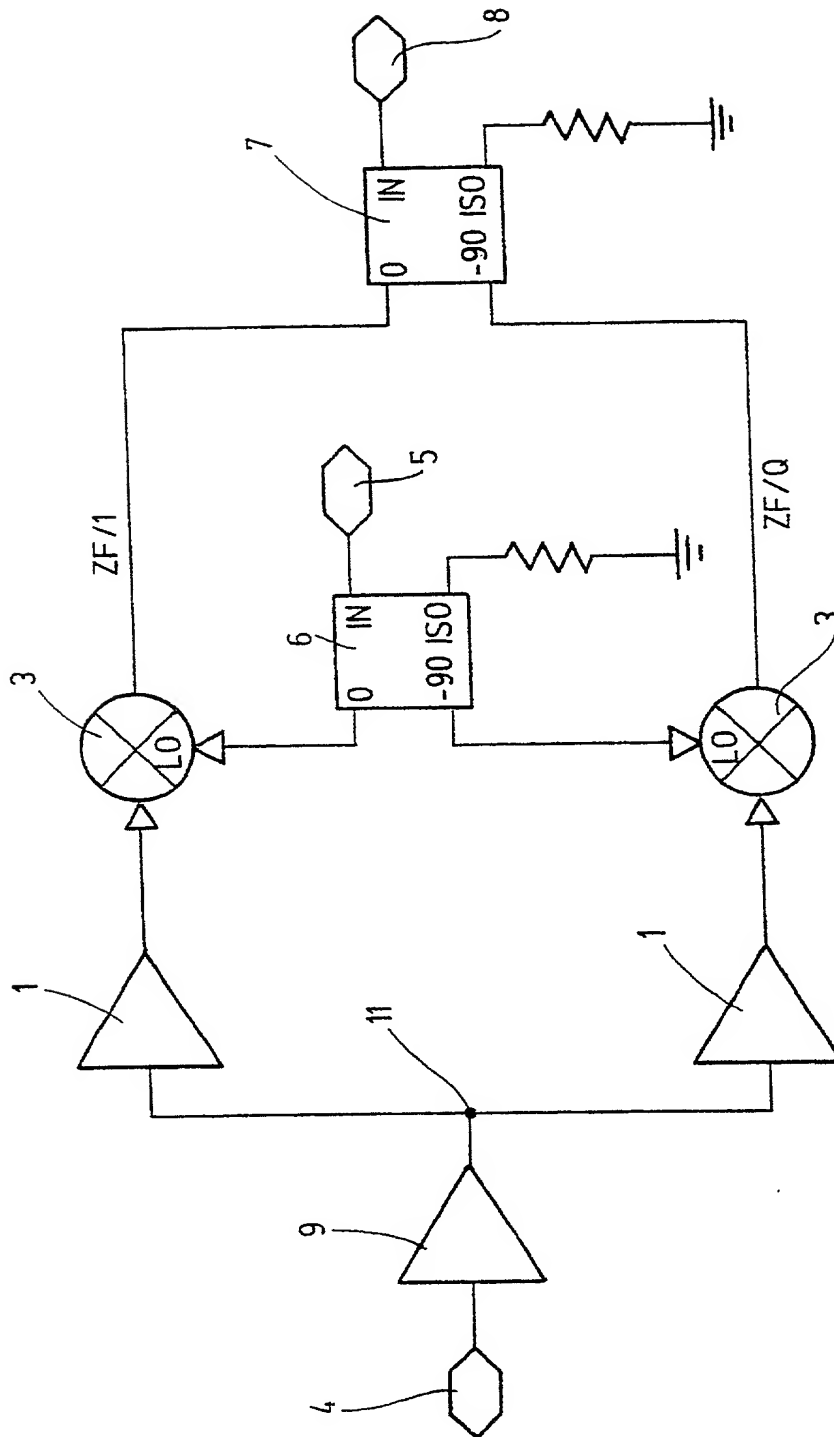


Fig. 1

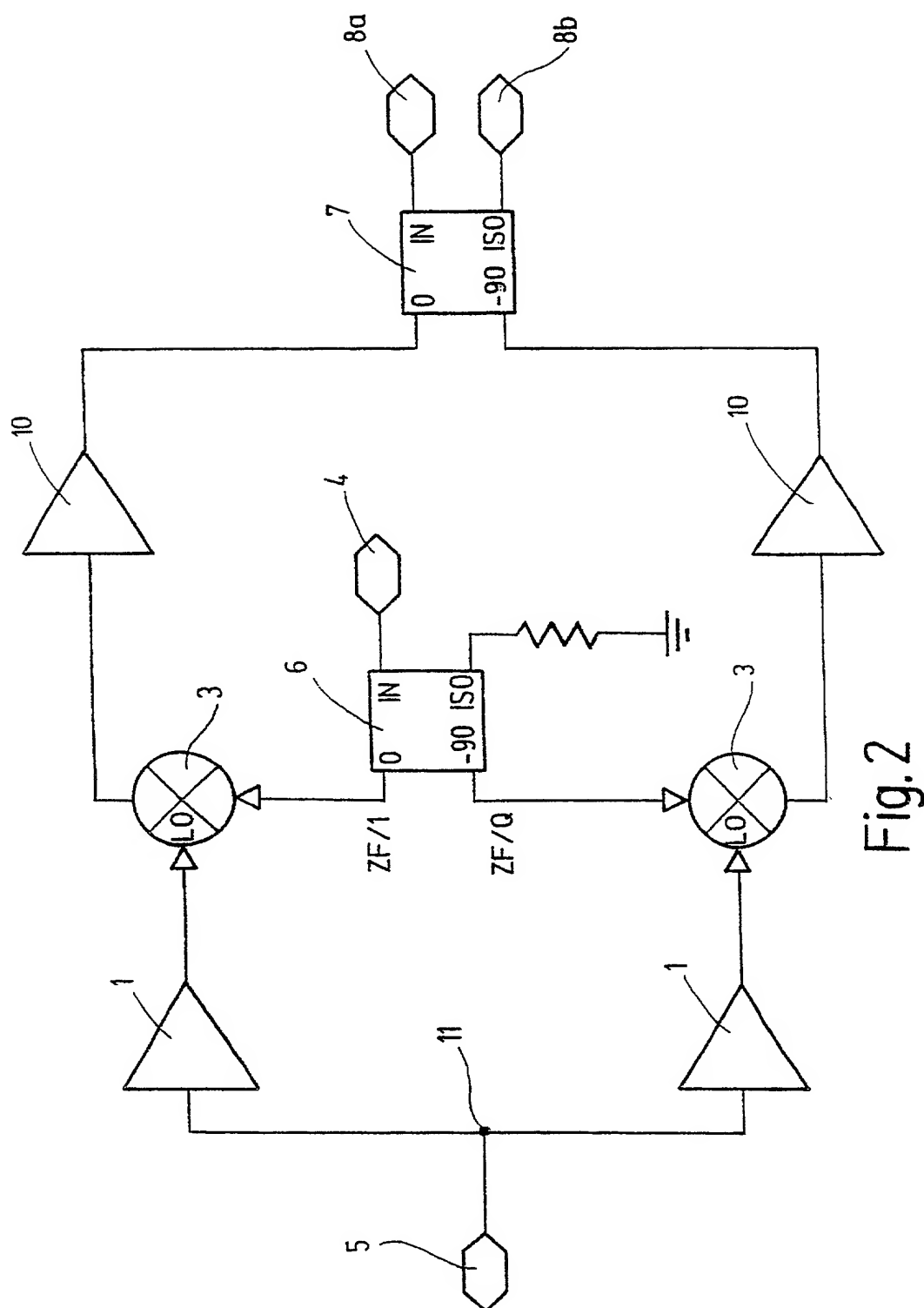


Fig. 2

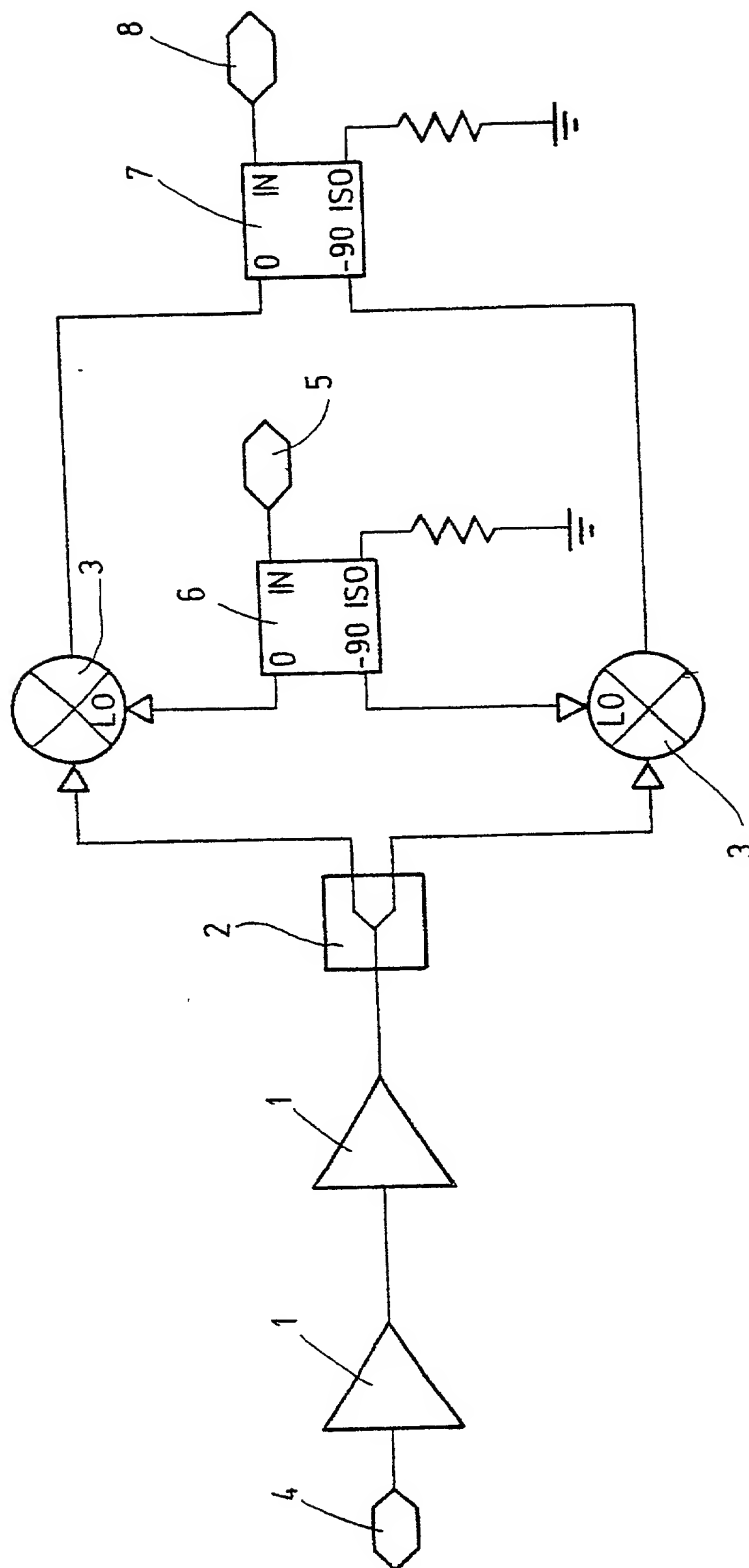


Fig. 3

Type a plus sign (+) inside this box → ☐

Approved for use through 8/30/98

PTO/SB/01 (5-95)

OMB 0651-0032

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

0010/PTO
Rev. 6/95U.S. Department of Commerce
Patent and Trademark Office

Attorney Docket Number

P/63020

First Named Inventor

GILL, HARDIAL

**DECLARATION FOR
UTILITY OR DESIGN
PATENT APPLICATION**

COMPLETE IF KNOWN

Application Number

10/019,923

Filing Date

NOVEMBER 9, 2001

Group Art Unit

Examiner Name

☐ Declaration OR
Submitted
with Initial Filing☒ Declaration
Submitted after
Initial Filing

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SINGLE SIDEBAND MIXER

(Title of the Invention)

the specification of which

☐ is attached hereto
OR☒ was filed on (MM/DD/YYYY)

NOVEMBER 9, 2001

as United States Application Number or PCT International

Application Number

10/019,923

and was amended on (MM/DD/YYYY)

(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119 (a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365 (a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
19921921.4	Germany	05.12.99 (May 12, 1999)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
PCT/IB00/00839	INTERNATIONAL	05.12.00 (May 12, 2000)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority sheet attached hereto.

Burden Hour Statement: This form is estimated to take .4 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Type a plus sign (+) inside this box → ☐

DECLARATION

Page 2

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §385(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

☐ Firm Name Customer Number or label
☒ OR
☒ List attorney(s) and/or agent(s) name and registration number below.

Name	Registration Number	Name	Registration Number
David B. Kirschstein, Esq.	17,244	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;">3</div>	
Alan Israel, Esq.	27,564		
Martin W. Schiffmiller, Esq.	30,421		

☐ Additional attorney(s) and/or agent(s) named on a supplemental sheet attached hereto.

Please direct all correspondence to: ☐ Customer Number or label OR ☒ Fill in correspondence address below

Name **KIRSCHSTEIN, OTTINGER, ISRAEL & SCHIFFMILLER, P.C.**
Address **489 Fifth Avenue**
Address
City **New York** State **New York** ZIP **10017-6105**
Country **United States** Telephone **(212) 697-3750** Fax **(212) 949-1690**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name	Hardial	Middle Initial		Family Name	GILL	Suffix e.g. Jr.	
Inventor's Signature	<i>X Hardial Gill</i>					Date	23 November 2001
Residence: City	Backnang	State		Country	Germany	Citizenship	British
Post Office Address	Elly-Heuss-Knapp-Weg, 38/3, D-71522 Backnang, Germany						
Post Office Address							
City	Backnang	State		Zip	D-71522	Country	Germany
Applicant Authority							

☒ Additional inventors are being named on supplemental sheet(s) attached hereto

Type a plus sign (+) inside this box → ☐

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

Name of Additional Joint Inventor, if any:

☐ A petition has been filed for this unsigned inventor

Given Name	Gregor	Middle Initial		Family Name	GERHARD	Suffix e.g. Jr.	
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Inventor's Signature	<i>G. Gerhardt</i>	Date	23 November 2001
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Residence: City	Murrhardt	State		Country	Germany	Citizenship	German
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Post Office Address	Heinrich Von Zuegel-Strasse 15, D-71540 Murrhardt, Germany.						
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Post Office Address							
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City	Murrhardt	State		Zip	D-71540	Country	Germany	Applicant Authority	
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Name of Additional Joint Inventor, if any:

☐ A petition has been filed for this unsigned inventor

Given Name	Stefan	Middle Initial		Family Name	KOCH	Suffix e.g. Jr.	
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Inventor's Signature	<i>Stef Koch</i>	Date	23 November 2001
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Residence: City	Oppenweiler	State		Country	Germany	Citizenship	German
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Post Office Address	Am Neufeld 21, D-71570 Oppenweiler, Germany.						
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City	Oppenweiler	State		Zip	D-71570	Country	Germany	Applicant Authority	
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Name of Additional Joint Inventor, if any:

☐ A petition has been filed for this unsigned inventor

Given Name		Middle Initial		Family Name		Suffix e.g. Jr.	
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Inventor's Signature		Date	
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Residence: City		State		Country		Citizenship	
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Name of Additional Joint Inventor, if any:

☐ A petition has been filed for this unsigned inventor

Given Name		Middle Initial		Family Name		Suffix e.g. Jr.	
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Inventor's Signature		Date	
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Residence: City		State		Country		Citizenship	
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City		State		Zip		Country		Applicant Authority	
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☐ Additional inventors are being named on supplemental sheet(s) attached hereto